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Phase behavior of star-shaped polystyrene-block-poly(methyl methacrylate) copolymer SANGSHIN JANG, HONG CHUL MOON, DUSIK BAE, JONGHEON KWAK, YOUNGMIN LEE, Pohang University of Science and Technology, WONBO LEE, Sogang University, JIN KON KIM, Pohang University of Science and Technology — Phase behavior of star-shaped 18-arm polystyrene-block-poly(methyl methacrylate) copolymers ((PS-b-PMMA)$_{18}$) with various volume fraction of PS block (f$_{PS}$) was investigated via transmission electron microscopy and small angle X-ray scattering. (PS-b-PMMA)$_{18}$ was synthesized by atom transfer radical polymerization from α-cyclodextrin (α-CD) having 18 functional groups for the initiation. We also prepared corresponding linear PS-b-PMMAs by cutting the ester groups connecting α-CD and PS chains in (PS-b-PMMA)$_{18}$ through the hydrolysis. The microdomains of (PS-b-PMMA)$_{18}$ changed from body-centered cubic spheres, hexagonally packed cylinders, perforated lamellae, and lamellae with decreasing fPS from 0.7 to 0.2. Interestingly, (PS-b-PMMA)n with f$_{PS}$ of 0.23 showed highly asymmetric lamellar microdomains, while corresponding linear PS-b-PMMA with the same volume fraction exhibited spherical microdomains. Thus, the microdomains are highly affected by the molecular architecture of block copolymer.

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